0.4-Ω, Low Voltage, Dual SPST Analog Switch

DESCRIPTION

The DG2747, DG2748, and DG2749 are high performance, low on-resistance analog switches of dual SPST configuration.

Built on Vishay Siliconix's sub-micro CMOS technology, the DG2747, DG2748, DG2749 achieve switch on-resistance of 0.4 Ω at 2.7 V V+ and 0.3 Ω at 4.3 V V+. It provides 0.1 Ω flatness at 2.7 V V+, and total harmonic distortion to 0.03 % (frequency range 20 Hz to 20 kHz). It achieves - 72 dB off-isolation and - 100 dB crosstalk at 100 kHz. Its - 3 dB bandwidth is up to 93 MHz.

It can switch signals with amplitudes of up to V_{CC} to be transmitted in either direction.

The select pins of the control logic can tolerate voltages above V+. Logic high is 1.4 V to make it compatible with many low voltage digital control circuits.

Combining wide operation voltage, low power, high speed, low on-resistance and small physical size, the DG2747, DG2748, DG2749 are ideal for portable and battery powered applications requiring high performance and efficient use of board space.

The DG2747, DG2748, DG2749 come in a small miniQFN-8 lead package (1.4 x 1.4 x 0.55 mm). As a committed partner to the community and the environment, Vishay Siliconix manufactures this product with the lead (Pb)-free device terminations and is 100 % RoHS compliant.

FEATURES

- Wide operation voltage range: 1.6 V to 4.3 V
- Low on-resistance: 0.4 Ω typ. at 2.7 V
- Low voltage logic threshold: $V_{th(high)}$ = 1.4 V at V+ = 3 V
- - 100 dB crosstalk at 100 kHz
- > 250 mA latch up current per JESD78
- Switch exceeds 7 kV ESD/HBM

Pb-free
RoHS
COMPLIANT

BENEFITS

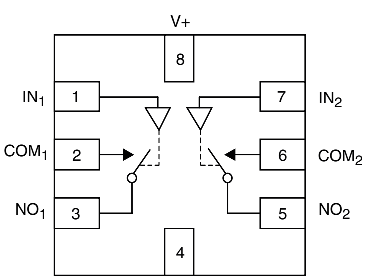
- Ultra small miniQFN8 package of 1.4 x 1.4 x 0.55 mm
- High fidelity audio switch
- Reed relay replacement
- Low power consumption

APPLICATIONS

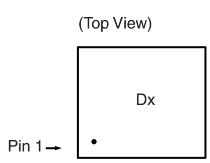
- Cellular phones
- Portable media player
- GPS
- PCMCIA cards
- Medical and test equipment

FUNCTIONAL BLOCK DIAGRAM AND PIN CONFIGURATION

DG2747
miniQFN-8L

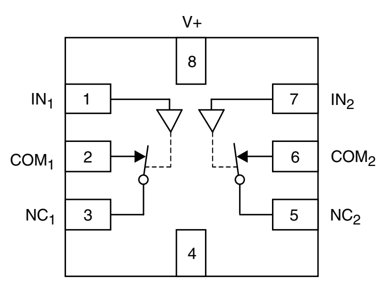


Top View

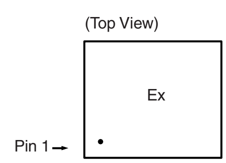


Device Marking: Dx for DG2747
x = Date/Lot Traceability Code

DG2748
miniQFN-8L

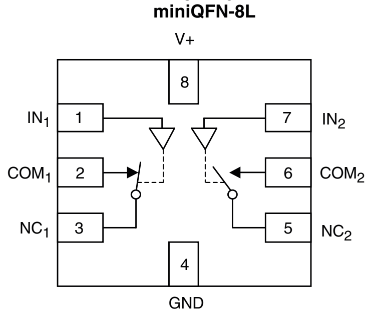


Top View

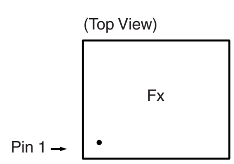


Device Marking: Ex for DG2748
x = Date/Lot Traceability Code

DG2749
miniQFN-8L



Top View



Device Marking: Fx for DG2749
x = Date/Lot Traceability Code

TRUTH TABLE						
Logic	DG2747		DG2748		DG2749	
	COM_1 and NO_1	COM_2 and NO_2	COM_1 and NC_1	COM_2 and NC_2	COM_1 and NC_1	COM_2 and NO_2
Low	OFF	OFF	ON	ON	ON	OFF
High	ON	ON	OFF	OFF	OFF	ON

ORDERING INFORMATION		
Temp. Range	Package	Part Number
- 40 °C to 85°C	miniQFN-8L	DG2747DN-T1-E4 DG2748DN-T1-E4 DG2749DN-T1-E4

ABSOLUTE MAXIMUM RATINGS T_A = 25 °C, unless otherwise noted			
Parameter		Limit	Unit
Reference to GND	V+	- 0.3 to 5.0	V
	IN, COM, NC, NO[a]	- 0.3 to (V+ + 0.3)	
Current (Any terminal except NO, NC or COM)		30	mA
Continuous Current (NO, NC, or COM)		± 300	
Peak Current (Pulsed at 1 ms, 10 % duty cycle)		± 500	
Storage Temperature (D Suffix)		- 65 to 150	°C
Power Dissipation (Packages)[b]	miniQFN-8L[c]	190	mW

Notes:
a. Signals on NC, NO, or COM or IN exceeding V+ will be clamped by internal diodes. Limit forward diode current to maximum current ratings.
b. All leads welded or soldered to PC board.
c. Derate 2.4 mW/°C above 70 °C.

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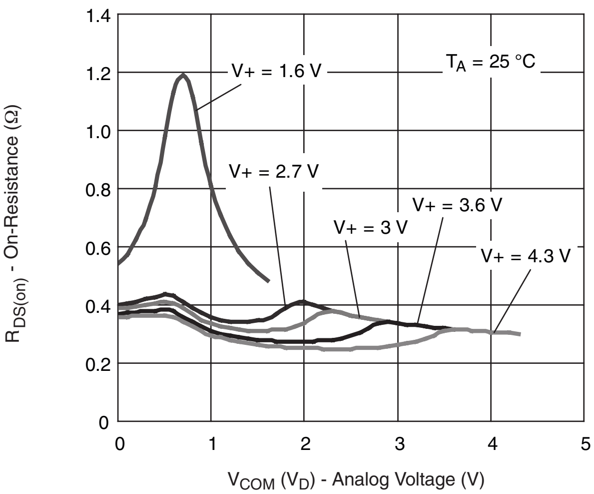
SPECIFICATIONS V+ = 3 V

Parameter	Symbol	Test Conditions Unless Otherwise Specified V+ = 3 V, ± 10 %, V_{IN} = 0.4 V or 1.4 V[e]	Temp.[a]	Limits - 40 °C to 85 °C Min.[b]	Typ.[c]	Max.[b]	Unit
Analog Switch							
Analog Signal Range[d]	V_{analog}	$R_{DS(on)}$	Full	0		V+	V
On-Resistance	$R_{DS(on)}$	V+ = 2.7 V, $I_{NO/NC}$ = 100 mA, V_{COM} = 0.5 V	Room		0.4	0.6	Ω
		V+ = 2.7 V, $I_{NO/NC}$ = 100 mA, V_{COM} = 1.5 V					
		V+ = 2.7 V, $I_{NO/NC}$ = 100 mA, V_{COM} = 0.5 V	Full			0.7	
		V+ = 2.7 V, $I_{NO/NC}$ = 100 mA, V_{COM} = 1.5 V					
R_{ON} Match[d]	ΔR_{ON}	V+ = 2.7 V, $I_{NO/NC}$ = 100 mA, V_{COM} = 0.5 V, 1.5 V	Room			0.03	
R_{ON} Resistance Flatness[d]	R_{ON} flatness	V+ = 2.7 V, $I_{NO/NC}$ = 100 mA, V_{COM} = 0.5 V, 1.5 V	Room		0.1	0.2	
Switch Off Leakage Current	$I_{NO/NC(off)}$	V+ = 4.3 V, $V_{NO/NC}$ = 1.0 V/3.3 V, V_{COM} = 3.3 V/1.0 V	Room	- 2		2	nA
			Full	- 10		10	
	$I_{COM(off)}$		Room	- 2		2	
			Full	- 10		10	
Channel-On Leakage Current	$I_{COM(on)}$	V+ = 4.3 V, $V_{NO/NC}$ = V_{COM} = 3.3 V/1.0 V	Room	- 2		2	
			Full	- 10		10	
Digital Control							
Input High Voltage	V_{INH}		Full	1.4			V
Input Low Voltage	V_{INL}		Full			0.4	
Input Current	I_{INL} or I_{INH}	V_{IN} = 0 or V+	Full	- 1		1	µA
Dynamic Characteristics							
Turn-On Time[e]	t_{ON}	V+ = 2.7 V to 3.6 V, V_{NO} or V_{NC} = 1.5 V, R_L = 50 Ω, C_L = 35 pF	Room		14	25	ns
			Full			27	
Turn-Off Time[e]	t_{OFF}		Room		12	25	
			Full			27	
Charge Injection[d]	Q	C_L = 1 nF, R_{GEN} = 0 Ω, V_{GEN} = 0 V	Room		10		pC
Off-Isolation[d]	O_{IRR}	R_L = 50 Ω, C_L = 5 pF, f = 1 MHz	Room		- 52		dB
		R_L = 50 Ω, C_L = 5 pF, f = 100 kHz			- 72		
Crosstalk[d]	X_{TALK}	R_L = 50 Ω, C_L = 5 pF, f = 1 MHz			- 90		
		R_L = 50 Ω, C_L = 5 pF, f = 100 kHz			- 100		
3 dB bandwidth[d]		R_L = 50 Ω, C_L = 5 pF	Room		93		MHz
Source Off Capacitance[d]	$C_{NX(off)}$	f = 1 MHz, V_{NX} = 0 V	Room		75		pF
Drain Off Capacitance[d]	$C_{COM(off)}$	f = 1 MHz, V_{COM} = 0 V	Room		55		
Drain On Capacitance[d]	$C_{COM(on)}$	f = 1 MHz, V_{COM} = V_{NX} = 0 V	Room		100		
Total Harmonic Distortion[d]	THD	V+ = 2.7 V to 3.6 V, V_{IN} = 0.5 Vp-p f = 20 Hz to 20 kHz	Room		0.03		%
Power Supply							
Power Supply Range	V+			1.6		4.3	V
Power Supply Current	I+	V_{IN} = 0 or V+	Full			1.0	µA

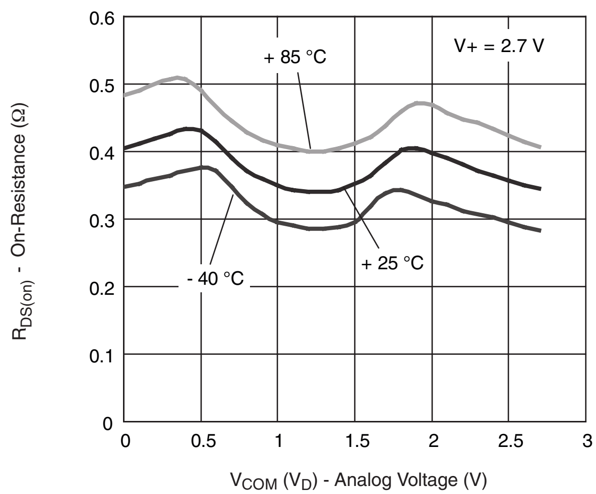
Notes:
a. Room = 25 °C, Full = as determined by the operating suffix.
b. The algebraic convention whereby the most negative value is a minimum and the most positive a maximum, is used in this data sheet.
c. Typical values are for design aid only, not guaranteed nor subject to production testing.
d. Guarantee by design, not subjected to production test.
e. V_{IN} = input voltage to perform proper function.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

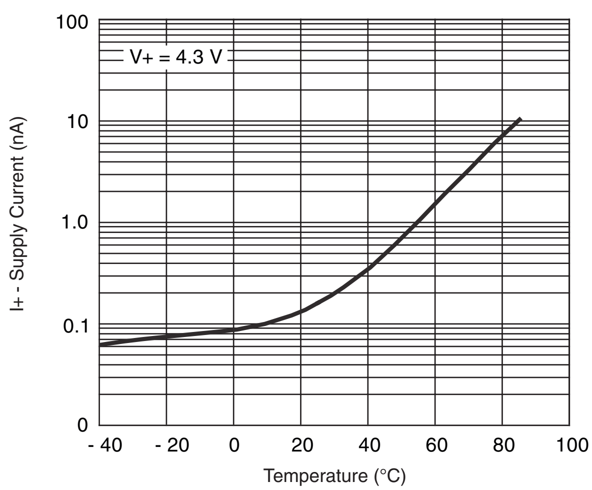
TYPICAL CHARACTERISTICS T_A = 25 °C, unless otherwise noted



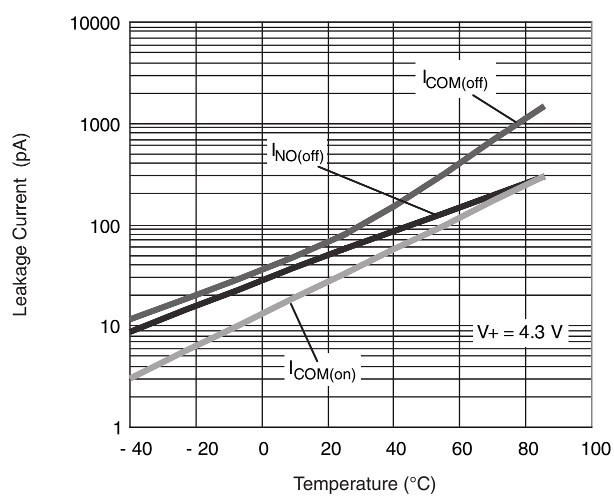
$R_{DS(ON)}$ vs. V_D and Supply Voltage



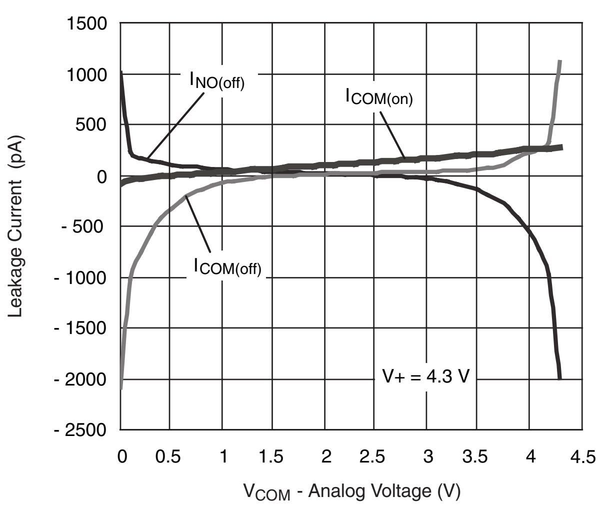
$R_{DS(ON)}$ vs. V_D and Temperature



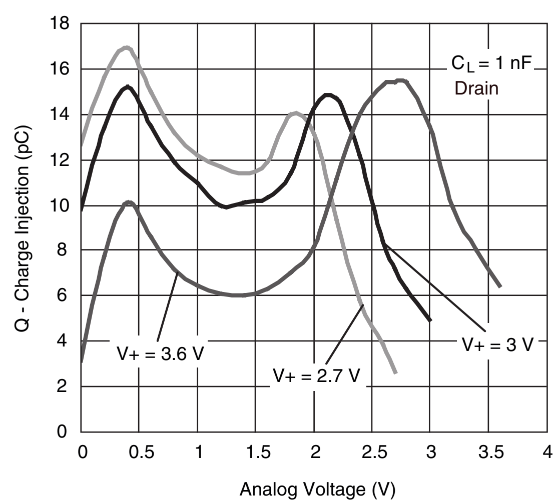
Supply Current vs. Temperature



Leakage Current vs. Temperature

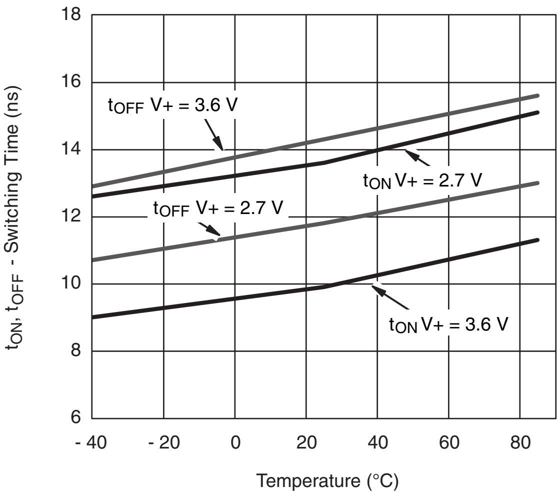


Leakage vs. Analog Voltage

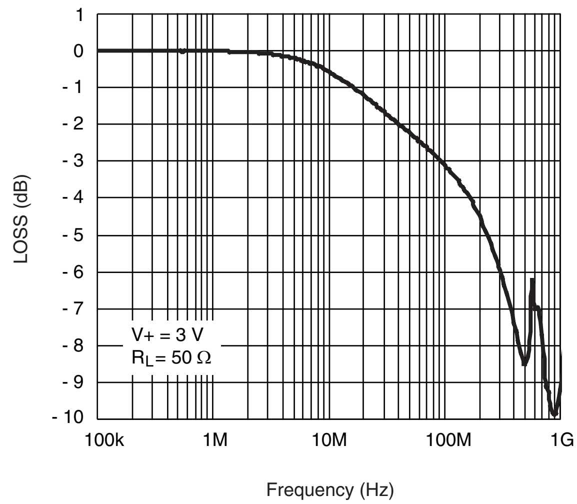


Charge Injection vs. Analog Voltage

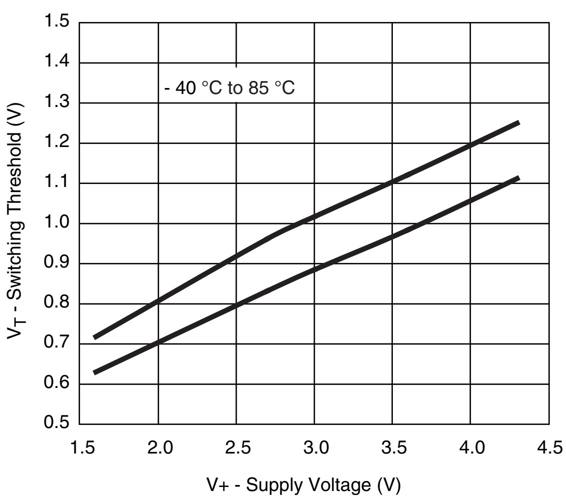
TYPICAL CHARACTERISTICS T_A = 25 °C, unless otherwise noted



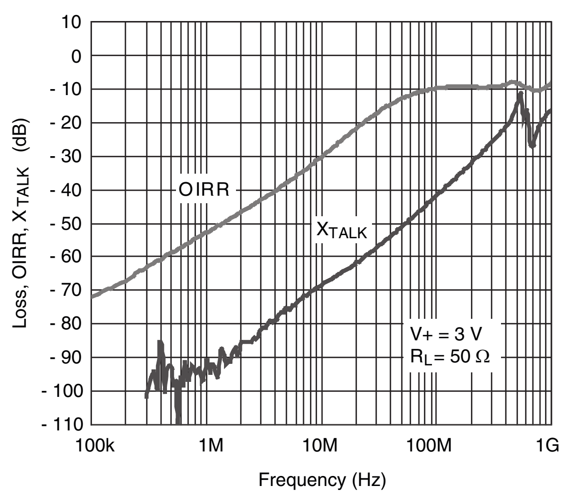
Switching Time vs. Temperature



Insertion Loss vs. Frequency

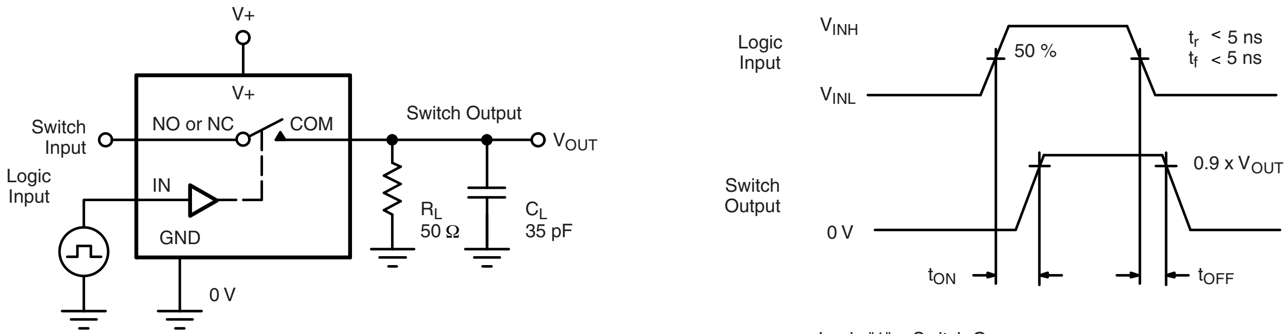


Switching Threshold vs. Supply Voltage



Off-Isolation and Crosstalk vs. Frequency

TEST CIRCUITS

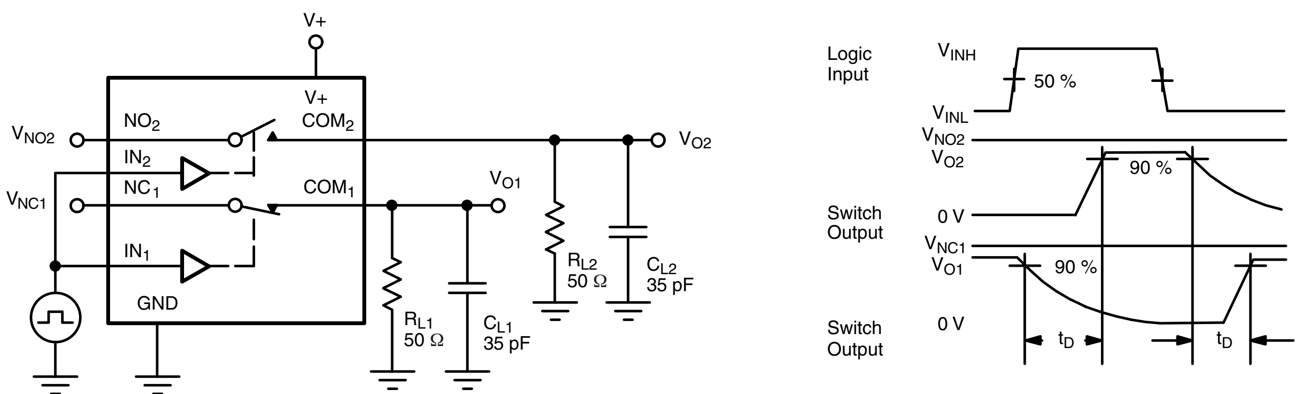


C_L (includes fixture and stray capacitance)

$$V_{OUT} = V_{COM}\left(\frac{R_L}{R_L + R_{ON}}\right)$$

Logic "1" = Switch On
Logic input waveforms inverted for switches that have the opposite logic sense.

Figure 1. Switching Time



C_L (includes fixture and stray capacitance)

Figure 2. Break-Before-Make (DG2749)

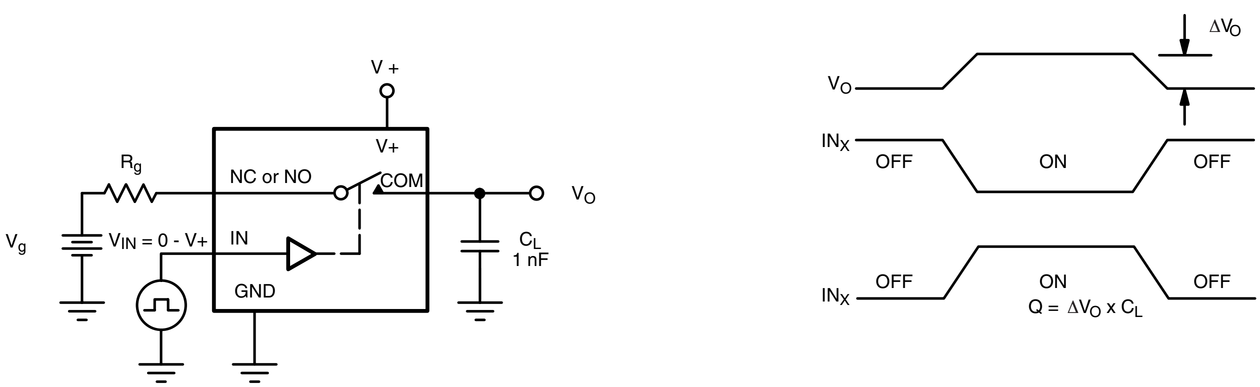


Figure 3. Charge Injection

TEST CIRCUITS

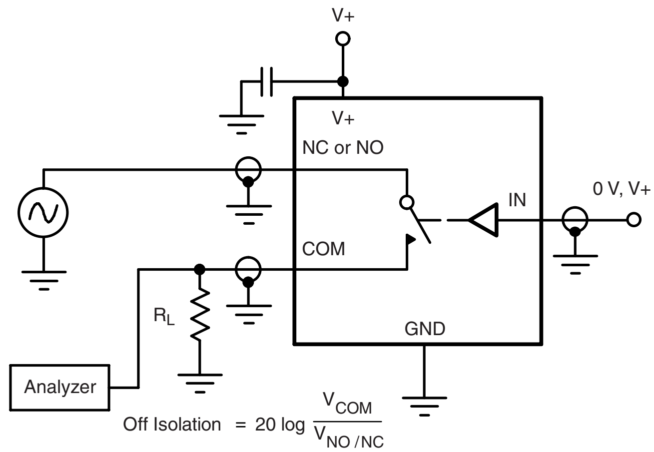


Figure 4. Off-Isolation

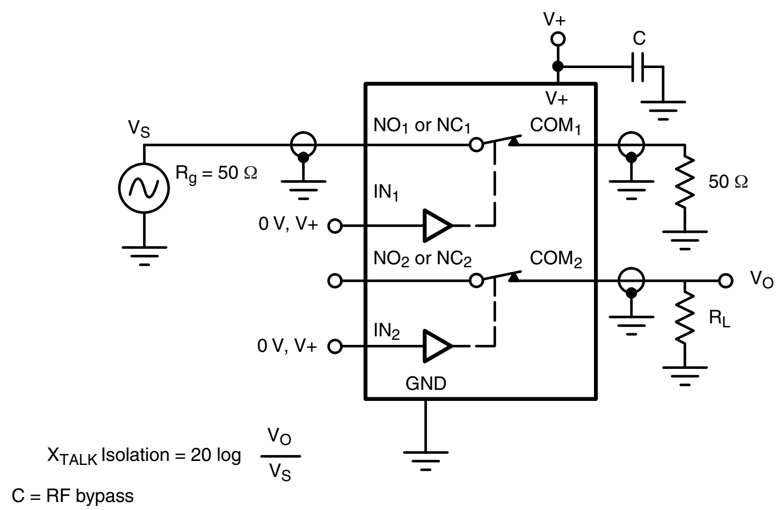


Figure 5. Crosstalk

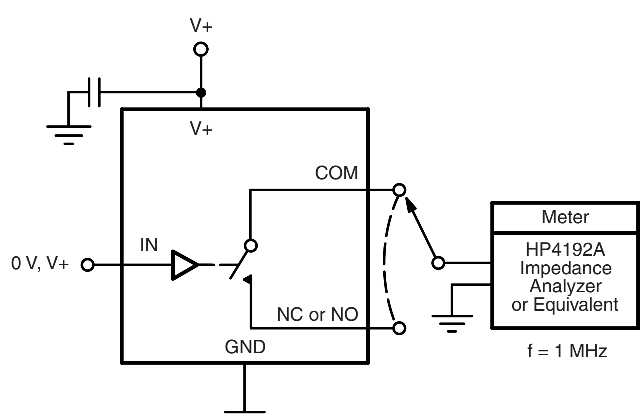


Figure 6. Channel Off/On Capacitance

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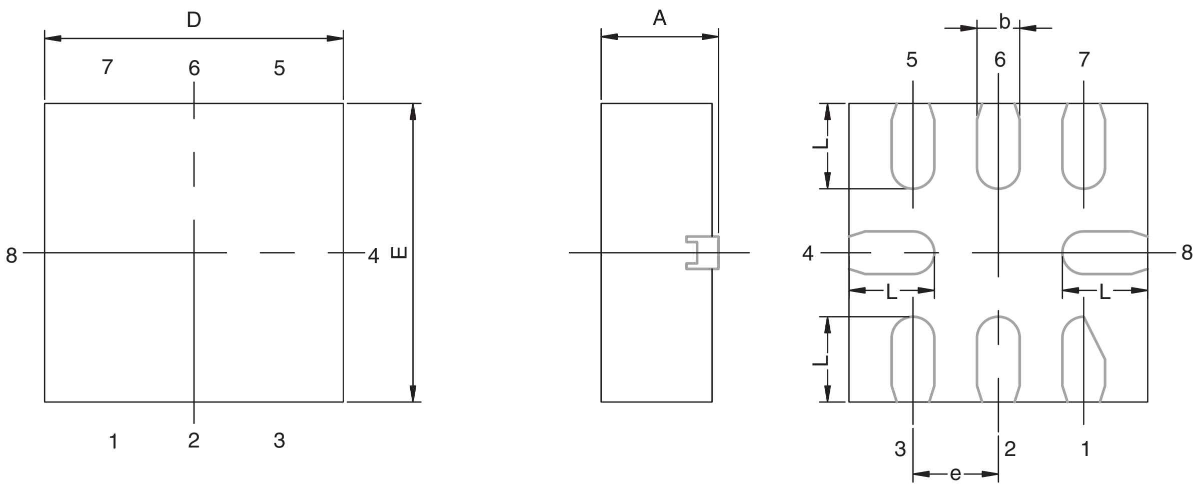
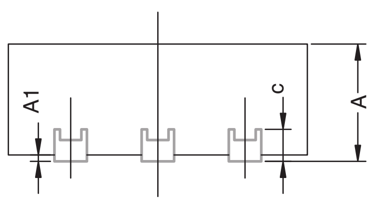
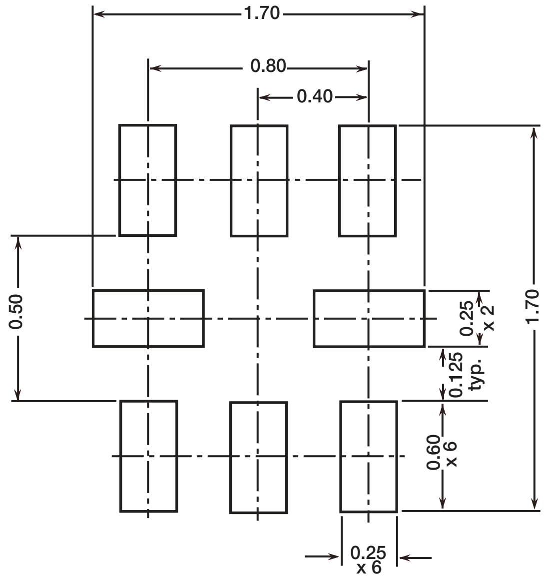
MINIQFN-8L CASE OUTLINE





DIM	MILLIMETERS			INCHES		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.50	0.55	0.60	0.0197	0.0217	0.0236
A1	0.00	-	0.05	0.000	-	0.002
b	0.15	0.20	0.25	0.006	0.008	0.010
c	0.15 REF			0.006 REF		
D	1.35	1.40	1.45	0.053	0.055	0.057
E	1.35	1.40	1.45	0.053	0.055	0.057
e	0.40 BSC			0.016 BSC		
L	0.35	0.40	0.45	0.014	0.016	0.018
ECN: C-08336-Rev. A, 05-May-08 DWG: 5964						

RECOMMENDED MINIMUM PADS FOR MINI QFN 8L



Suggested Minimum Pad
Dimensions in mm

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